

# APPROACHES FOR ACTIVE LEARNING OF AVIATION SPECIALISTS IN GEOGRAPHICAL INFORMATION SYSTEMS

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***Abstract.** The present paper has comprised author's experience in applying active learning's techniques and strategies in the "Geographical Information Systems" (GIS) subject meant for learned aviation students. It reveals the process of analyzing the results from the performance of small team project works, team projects, role games, placing the trainees in live situations, in which they have to take decisions to do with GIS applications. The principles of active learning applied at the courses, taught at the "Geographical Information Systems" subject at the Aviation Faculty of NMU were analyzed as well.*

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## 1. INTRODUCTION.

One of the major principles of the good practice in higher education is implementation and boosting active learning [1, 3, 4, 5]. Active learning shifts the focus from the teacher and his/her transmission of course's content to the student, as well as his active engagement in the material. Through active learning techniques and modelling by the teacher, students shed the traditional role of passive receptors, learning and practicing how to apprehend knowledge and skills and using them meaningfully.

According to Chickering and Gamson [1]: "Students do not learn much just sitting in classes listening to teachers, memorizing pre-packaged assignments and spitting out answers. They must talk about what they are learning, write about it, relate it to past experiences, and apply it to their daily lives." Many of the other principles, like the student-student collaboration, can also improve the process of active learning. Active learning involves providing opportunities for students to meaningfully talk and listen, write, read and reflect on the content, ideas, issues and concerns of an academic subject [2].

Active learning shifts the instruction's focus from what the instructor should teach or deliver to students to what he wants students to be able to do with the course material. Similarly, students must enter class prepared to use assigned readings and revised material from past classes, etc. Not only are students expected to be up-to-date with the course material, but also to have assimilated the material so they can use and built on it. When the students recognize that the course involves active learning, they will also recognize that they must be active if they are to succeed in the course.

When learning is active, students are those who do most of the work. They use their brains studying ideas, solving problems and applying what they learn. Active learning is fast-paced, funny, supportive and personally engaging.

Of course some of the students may not be willing to abandon their passive roles. But between those who are self-motivated and those who choose to sink, there is most likely a large middle group who, with some facilitating from the lecturer, will be active learners and markedly improve their performance and long-term command of the material.

## 2. BASIC ELEMENTS OF AN ACTIVE LEARNING

There are four elements that are essential to an active learning environment. These elements are:

- Clarifying course objectives and content
- Creating a positive classroom tone
- Arranging and managing the teaching space , and
- Knowing more about the students

The first thing to do once I am committed to active learning in the classroom is to evaluate and clarify the objectives of the class. I ask myself these questions, "What do I want my students to know by the end of the semester?" and "What do I want my students to be able to do by the end of the class?" Make a list of responses, otherwise known as "outcomes". Focus on the knowledge that I want my students to obtain. What this list should provide me with is another list, a "to do" list, which is a list of content items that I must address to ensure that my students meet these objectives.

Implementing active learning into a class will require us to cover less material, but the material that is covered will be learned more deeply. Covering less material does not mean that I assign less content to students, rather it means that more educational responsibility is placed on the student. Active learning requires that students be deeper involved in the process which will lead and require them to embellish their knowledge of the subject through their own study and research.

Now, take the updated course objectives and the "to do" list and create a very detailed syllabus. In addition to the basic information (course title, location, instructor information, textbook(s) and bibliography). The syllabus includes the following items:

- A brief statement that outlines the course objectives
- An overview of the course format, active learning techniques involved, and how the faculty member will use class time
- A statement regarding student responsibilities (class participation, attendance, timely completion of work)
- A description of the assessment techniques used to evaluate students and the grading policy
- A course outline of dates, topics and reading assignments
- Due dates for assignments and a policy statement regarding late assignments
- Academic policies and procedures

Secondly, work to create a positive, refreshing work environment for the students in the classroom. This might mean wall decorations or it might mean just environmental adjustments. For example in a GIS classroom, a teacher might hang GIS-generated tactical, navigation and meteorological maps or company posters on the walls. In addition, aerial photography, project examples, and other related items should be displayed. Use the wall "decorations" as a part of the class by addressing issues of map design or using a poster for a class case study.

Another part of the positive classroom is the idea of transitioning students from the "outside world" to the "classroom" which will aid in their learning process. One option is to start class by allowing students to write questions they would like addressed in today's class. Another option is to play relaxing, comforting music while students come into class and before classroom instruction begins. A third part of this is the demeanor of the teacher. The lecturer should work to make the students comfortable in class by being open to questions and comments (no question or comment should draw degrading comments), arriving early to talk with students, and/or by transmitting to students that the faculty member loves the subject and enjoys what he/she is doing. A positive mental attitude helps all around.

The third item to address in preparing a course for active learning participation is the teaching space. Whereas many of us don't have control over where we teach, we may have the opportunity to arrange the assigned space as we see fit. The arrangement of a classroom may be flexible or a challenge, but the idea is to draw students into the group and to establish a physical framework that makes students comfortable and want to enter into a discussion or group situation.

Most teachers consider that their major role is to teach. In active learning teacher's role is to assist students to learn on their own. The GIS teachers ease, manage and support students in the teaching process.

### **3. ACTIVE LEARNING TECHNIQUES AND THEIR USING IN GIS-CLASSES**

#### **a. Active Listening**

Active listening provides students with the opportunity to represent parts of the lecture in their own words. Students are assigned the task to paraphrase statements already expressed in the course of the lecture. In the course of the lecture there is always a chance to receive feedback from students. Questions regarding terms used in GIS, studied in other subjects, such as "Military Topography", "Military Geography", "Tactics", "Navigation", "Aviation Meteorology" are being asked. The aim is to think over these terms and considered from the point of view of GIS. The attention during a lecture is preserved by means of presenting fragments from applications with the help of which difficult tasks from fields like "Military topography", "Tactics" and "Navigation" are solved. To check what has been learnt, at the end of the lecture some questions taken out from a test on the material taught could be asked.

#### **b. Active Writing.**

On individual level: The GIS lecture is distributed to students in a summarized way both on paper and by e-mail. During the lecture the students supplement the material represented to them. Once the lecture has finished the

students are offered to exchange their notes and to fill in the missing parts from the lecture. They are assigned individually to write an essay on resources they have read. The summaries are exchanged and then students write resumes on the other student's resumes. Once the lecture has finished students are asked to answer in written form questions like "What I didn't comprehend?", "Which of the lecture's elements are unclear?". For each practical training the teacher prepares tasks which the students have to resolve by the time the next practical training is held. During the training the decisions are discussed and those tasks which have not been resolved yet are now managed.

On team level: Approximately every two weeks the students are assigned team projects which are most often done in group – comprised by 2 or 3 students. In the team project's explanation the teacher describes the method of working, the deadline, the method of evaluation. The team projects are carried out in group. The students choose team's leader, recorder and checker. The leader is responsible for the group's output, assigns tasks, keeps group "on track" and focused, controls the direction of the project. The recorder is responsible for computing and presentation of the final product. He gets supplies for team when necessary. The checker makes sure that everyone in the group understands the material. He ensures that everyone in the group is prepared to make their part of the presentation.

**c. Active Reading.**

Material to be read is chosen every week. Most often these are texts taken out from the description of MATLAB Mapping Toolbox [6] or web materials. Each student has to prepare a short resume on the material he/she has read.

**d. Brain Storming**

It is applied in practical activities when new and more difficult tasks are solved.

**e. Using Software Tools.**

We use MATLAB Mapping Toolbox [6] as a working environment of the subject. Small fragments of different programs are being implemented during lectures in order to illustrate the matter discussed. Each student performs a similar fragment with different details during the practical trainings.

**f. Role playing.**

During practical trainings the students are assigned roles related to their future professional activities, such as pilots, air traffic control officers, military officers. The future pilots and navigators are assigned tasks to do with flights' planning. With the help of an application developed using MATLAB Mapping Toolbox a flight's plan based on a route assigned by the teacher is elaborated (mission plan).

The best students are assigned teachers' roles. They perform a part of a lecture in front of their colleagues.

## **4. APPROACHES FOR ENCOURAGING ACTIVE LEARNING**

### **Extended Research Outside of the Classroom**

Often because of time constraints, I am unable to cover a topic in as much detail as I (and some students) would like, and thus, I give assignments where students are asked to gain more knowledge on a topic area. Many times students will actively gain this information from various Internet GIS-sites. We will then discuss in class the information they've gathered and the validity of such information. This is a great tool that encourages active learning, and discussing more than just the topic allows students to evaluate GIS-materials they find on the Internet.

In each lecture the students are provided with GIS-resources on the Internet which they should review and then write down their estimation. This aims at their better memorizing, explaining and applying the material they have learnt.

One of the directions of active learning is the resource-based learning. It is driven by using different types of information resources in order to expand learning environment. The GIS students are turning into active students in the course of building up their own GIS knowledge base when they use different information sources – course user guide, lectures, manuals, software environments, Internet materials, NATO and ISO geographic standards [7,8], etc.. GIS active learning is effectively applied through the simultaneous participation of the student, teachers, library and the learning environment. The active participation of students increases when there is a proper way of defining the goals, activities and training evaluation.

### **Assignments and Tests That Provide Quick Feedback**

The assignments and tests that are offered the students support them in achieving their goals in the process of active learning. The tests with questions and answers offered (multiple choice questions) provide feedback on whether the material has been comprehended. The tests are held automatically which saves teaching time.

### **Interacting with lectures**

The lecture outlines, that are MS Word or PowerPoint documents are published on faculty internal webpages. The student can take that document and customize it (before or after class) for note-taking, questions, etc. I think that distributing them in class gives the students a more active role, right off the bat, in their learning process.

## 5. CONCLUSION

In conclusion, the key to workable, active learning environment is to remember that everyone learns differently and that the lecturer does not have to be in the teaching spotlight. Allow the students to take responsibility for their educational advancement. Active learning is a student centered approach to education. It helps students learn to learn. Active learning in GIS teaches critical thinking, problem solving and spatial reasoning skills, as opposed to rote memorization and connects students to the subject matters.

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